INTEGRATING SPATIAL ANALYSIS TOOLS INTO GIS

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Abstract:
Pin mapping is a fast and useful first step in identifying a crime problem, but more objective methods are needed to conduct unbiased analyses of the spatial distribution of crime. This panel discusses the strengths and weaknesses of different statistical strategies for analyzing crime patterns, from short-run alerts to longer term analyses, and discusses how these methods can be integrated into GIS.

I. Computer Mapping for What?

The appropriate analysis depends on the question at hand, the audience, and the goals.

Some Law Enforcement Applications for spatial data . . .

1. Communication

with neighborhood groups
within the department (hierarchy, other divisions, line officers)
with the media

2. Decisions

Crime Analysis (central research, planning, annual reports)
Local Problem-solving-e.g. firearms availability
Evaluation of crime reduction programs around 4 subsidized housing projects.
Investigation (linking cases, linking incidents over time, linking victim to offender to incident)

Additional Analysis

1. STAC
A. Large boundary - 250 meter search
B. Small boundary 125 meter search
C. Show output
    1. Parameters and id
        a. boundary
        b. data
        c. search radius
        d. records outside boundary–explain
    2. Ellipse descriptions
        a. Clusters may not equal ellipses
        B. No necessary relationship between ellipse size and density
    3. Density outside any ellipse
    4. Nearest Neighbor Analysis

2. Contour Mapping (Vertical Mapper)

Describes overall pattern–not just dense clusters- based on interpolation of a count of robberies within a 75 meter grid using the same window as STAC

3. Distance to a transit stop–theory based routine activity–intensity of use (Angel)
   A. Manhattan Distance
   B. Chicago-block 650 feet & 10 stations on north side.
   C. Bronx 97 stations – whole Bronx.

II. STAC Demo

II. Data Requirements for Spatial Analysis

1. First, the basic requirements of a GeoArchive:

a. Layers linked by spatial references in dataset
b. Address-based, as well as areas, lines and map data
c. Must have information behind the pictures on the map (points, areas)

2. Additional requirements for spatial analysis:

a. Must have x and y coordinates *as part of the database*
But can use GPS to identify points

b. Boundaries are required for clustering analyses
- All clustering analysis techniques require:
I. within a defined boundary
ii. point scatter

III. Some basic analysis techniques

1. Linking addresses (covered in other workshop)

2. How to deal with multiple occurrences at a point.

Some alternatives:
different icons
number as an icon
little bar charts

Best method??:
Points sized to the number of occurrences.

3. How to combine point and area data in the same analysis

4. Measuring distance and multiple distances

Buffering

"Radius count" (buffer around a transit stop)

Buffer along a line (from stop to stop)
Minimum distance to a transit stop (Bronx and Chicago)

5. Point pattern analysis

Two types
NNA and point pattern

STAC and Vertical Mapper

Demonstrate STAC with John Freeman's analysis of firearm data

Covers the map: can we be more specific?

Demo: thematic by type of offense

drug=blue; nonlethal violent=red; homicide=black star or square; other=green

Demo: Points sized by number of occurrences at an address

Still covers the map; how can we summarize the pattern?

1. Demo: Thematic map (choropleth)

A. Street gang-related violent offenses (rates??) across districts
B. Add points.

But a thematic map loses information.

A cluster bisected by an arbitrary district border.
A small cluster "hidden" within a large district.

How can we summarize the pattern without losing information?

2. Demo: Clusters (Hot Spot Areas)

A. STAC Hot Spot Areas of violent street gang related offenses citywide, shown with the points.
B. Drop the points. Add the thematic map.
C. Add the homicides.